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THE

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Annual swimming competition for Seniors; Nedungayam 1932.

The annual swimming competition commenced at 5 P. M., on the 13th December 1932 at Nedungayam. There were four items, and they took place in the following order.

I. Medal Race, with the current from below the bridge—150 yards.

II. Across stream, with breast or side strokes from the right to the left bank.—50 yards.

III. Beginners' race from raft in the midstream to the right bank.—20 yards.

IV. Swimming on the back from the left to the right bank.—50 yards.

The weather was bright and clear, and the Working Plans Conservator, Mr. T. Clear graced the occasion by his presence near the winning post with the Principal.

1. *Medal Race* :—For the first item, the medal race, students Gulvadi, Saleh, Buddholia, Sarawate, Patel Kalbag, Varma, and Siddiki competed. The starting

point was just below the pier. All the competitors stood in the water in a line at breast depth ready to plunge at the momentous whistle blast—momentous in the sense that it marked the occasion when a decision was made as to who among the competitors should have the proud privilege of walking up to the dais, on the prize distribution day in June, to receive the championship medal, before a large and distinguished audience. The shrill blast rent the air, and simultaneouly one splash on the water and in the distance all dark heads floating on the surface of the water, and hands pulling and tugging the water were seen. About 20 yards from the start four competitors were seen abreast of one another. Thence the competition grew keener. Patel and Buddholia immediately took the lead closely followed by Varma and Sarawate. Buddholia continued to lead followed by Patel not more than five yards behind. The victory of one man over the other was not certain and remained yet to be seen as both had the advantages and disadvantages over his rival. The leading pair afforded an interesting sight. Thrill and suspense prevailed as there were champions for each. Buddholia's slim and nimble figure floating like a cork in water, and his excellent overhand strokes afforded an admirable sight. His rival Patel was in no way inferior to him. His style of swimming was a combination of breast and side stroke. He was coming at a furious pace like the charging of a war horse and was gaining on his opponent every moment. About the middle of the stream the leading man slackened, and was trying his luck with one hand overstroke. The pair continued like this up to about 30 yards from the winning post, and the leading man kept his opponent as far away as he tried to gain on him. In the last Buddholia gave a stamp of finality to the race by one sprint which left all competition far behind as his rival

lacked the overhand style. The last sprint was simply admirable, and on his touching the boat, the blast of the whistle proclaimed him the winner. His timing was 3 min., 11 secs. Patel finished in 3 min., 23 secs. Varma and Sarawate were third and fourth, and came in 4 min., 43 secs., and 4 min., 45 secs. respectively. The others completed the course.

2. *Across stream, from right to left banks.—50 yds.* The competitors for this were: Sahu, Kalbag, N. V. Nair, Sarawate and Siddiki. The distance was 50 yards and there was keen competition between Nair and Sarawate. Sarawate beat Nair by four seconds, his time being 54 seconds. His wonderful capacity to enter this race, and win soon after contesting in the hundred and fifty yards race which took place barely twenty minutes back deserves applause. Kalbag came third, Siddiki fourth, and Saleh fifth. It is worthy of mention in this connection that Sahu picked up swimming in this camp and was so soon able to compete with the veteran swimmers.

3. *Beginners' Race:-20 Yards—From raft in mid-stream to right bank:*—The competitors for this were Mohamad Saleh, Mulay, Rajagopalan, and Singh. This race was an interesting sight especially as it afforded a comedy in the midst of the other two more strenuous and Seniors' races competed for by adepts trying for merit while the former tried to gain the shore to avoid being drowned. Among the beginners, Seranjame had the advantage of the overhand strokes which the others lacked, and reached the shore with fair ease commendable in a beginner. He was followed by Mulay and Saleh who reached shortly after.

4. *Swimming with back-strokes—50 yards, from left to right bank*:—This race was competed for by Dube,

Dasondi, Kalbag, Siddiki, Varma and Sahu. All were equally g od at t is a t of swimming on the back, and the race was a very keen one. All were standing in the water with their backs towards the wining post. The whistle was blown. All hands went up and came down behind the head. scooping the water. The sight was pleasing. All looked like jolly boats having oars on either side. Varma won the race in 54 secs, Kalbag came next in one minute, closelv followed by Dube. The others were able to finish the race, nobodv lagging behind excessively. Credit goes to Kalbag and Siddiki who had the fortitude to compete for all the races that were open that day.

Our thanks are due to the Conservator, the Principal, and the other visitors who witnessed our races and to Ranger Mr. P. Sankunni Menon who kindly recorded the timings; also to Mr. E. B. Ramachandra Rao, for organising the events.

N. VELAYUDHA NAIR.

The Annual Athletic Sports, Madras Forest College, 1932.

This year the weather conditions were satisfactory though on the day of the heats there was a heavy shower at the close of the evening. The days following were clear, which improved the tract for the final day.

The heats were held on the 18th, and the finals on the 22nd October. The programme commenced at 3 P. M. and lasted till 6 P. M. The results were :—

I. *100 yards :—*

1. Ahmed Khan....... 11 Sec. (Record 10 3/5 Sec.)
2. J. C. Sarawate.
3. N. D. Kelbag.

II. *High Jump* :—

1. J. C. Sarawate........ 4 ft. 6 in. (Record 5 ft. 1½ in.
2. H. U. Dasondi.
3. S. V. Gulvadi.

III. *120 yards Hurdles* :—

1. J. C. Sarawate.......17 2/5 Sec. (Record 17 Sec.)
2. N. D. Kelbag.
3. Ahmad Khan.

IV. *Throwing the Cricket ball* :—

1. J. C. Sarawate .... 80 yds., 2 ft., 4 in. (Record 94 yards, 2 ft.)
2. K. Krishnamurthi.
3. K. N. Singh.

V. *Quarter mile* :—

1. J. C. Sarawate........ 62 Sec. (Record 54 3/5 Sec.)
2. Ahmed Khan.
3. S. V. Gulvadi.

VI. *Shot put* :—

1. A. A. Siddiki .... 20 ft. 7½ in. (Record 21 ft.
2. J. C. Sarawate.
3. C. B. Pemmiah.

VII. *Invitation half mile* :—

1. } London Mission High School........ 2 min. 18
2. } sec. (Record 2 min 15 2/5 sec.
3. Police Recruit School.

VIII. *Half mile* :—

1. B. H. Patil........ 2 min. 30 2/5 sec. (Record 2 min. 17 sec.)
2. R. R. Budholia.
3. N. P. Chirukandan.

IX. *Long jump* :—

1. J. C. Sarawate .... 17 ft. 2½ in. (Record 18 ft. 9 in.
2. S. V. Gulvadi.
3. N. D. Kelbag.

X. *Peons' Race* :— 100 yds.

1, Syed Ali............ 12 1/5 sec.
2. Ali.
3. Alavi.

XI. *Mile Race* :—

1. N. P. Chirukandan, 5 min. 42 sec. (Record 5 min. 27 1/5 sec.)
2. N. D. Kelbag.
3. G. D. Seranjame.

XII. *Servants' race* :— 100 yds.

1. Govinda Rao...... 13 sec.
2. Vasudeva Pillay.
3. Madavan.

XIII. *Relay Race* :—

1. Bombay Team. 4 min. 40 sec.
2. Coorg „
3. Madras „

XIV. *Tug of war* :—

Winning Team : Police Recruit School.

After the sports were over, Mr. R. D. Richmond C. I. E., Chief Conservator of Forests, distributed the cups and medals to the several winners. The Richmond cup for the highest aggregate number of points was won by J. C. Sarawate, who stood first in five of the seven items he competed for.

The function terminated with three cheers to the Chief Conservator and the guests.

N. D. KELBAG.

College Notes.

1. By the retirement on November 19th, 1932, of Mr. R. D. Richmond, C.I.E., the Madras Forest Department has lost a very distinguished and capable officer, and in the words of Mr. S. H. Slater, C.I.E., I.C.S., at a recent college prize-day, "a great administrator." Mr. Richmond joined the department on November 16, 1901 as Assistant Conservator of Forests, and became a Deputy Conservator in 1907. From January 1919 to February 1922 he was on deputation as Assistant Inspector-General of Forests to the Government of India. In 1923 he was confirmed as Conservator, and in 1927 became Chief Conservator, Madras. He was one of the very few (two) recipients in the Madras Presidency of the decoration C.I.E., conferred on the King's birthday last year.

It is gratifying to note that he has not left India, but still remains in this Presidency as a member of the Madras Services commission.

* * *

2. We are glad to note that the title of "Rao Sahib" has been recently conferred on M. R. Ry. V. N. Seshagiri Rao Avl., B.A., Extra Assistant Conservator of Forests, and Instructor, Madras Forest College, Coimbatore. The title is chiefly in recognition of his good work in the Rampa agency, East Godavari District.

* * *

3. We congratulate Mr. M. K. Nayar, M.A., I.F.S., Senior Instructor, Madras Forest College on his luck in having bagged a rogue elephant in Mt. Stuart on the 25th of November last.

* * *

4. We record with deep regret the death following an operation on November 23, 1932, at the Coimbatore Head Quarters hospital, of student M. G. Nanjunda of the 1932–34 Division of the Madras Forest College. He was the right type of recruit for training in the Forest College, and was very popular with every one. We tender to his parents our heartfelt sympathy.

Spike in Santalum album.

(Abstract by Mr. S Rangasami, M. R. Hons., of the quinquennial survey report prepared by Mr. M. Sreenivasayya, B.A.. A.I.I.Sc., Indian Institute of Science, and the Madras Forest Department.)

The following is a brief and up-to-date account of the important results arrived at in connection with the spike investigation of sandal :—

(1) The sandal plant normally functioning in all its physiological activities, can at no stage of its life, afford an independent existence.

(2) A sandal plant attracts or repels the insect fauna according to the nature of its host or group of hosts.—(Chatterjee N. C.)

(3) The resistance of certain sandal to spike is either autogenic or acquired by the nature of its associates or environmental conditions or both.

(4) Autogenic resistance is usually observed in plants with a high haustorising capacity and a comparitively large root system in the seedling stage.

(5) Acquired resistance has so far been noticed in in the case of sandal associated with *Cassia siamea*, *Casuarina*, *Azadirachta indica*, *Murraya koenigii*, *Dodonea viscosa*, *Semecarpus anacardium*, *Ficus bengalensis*, *Sarcostemma brevistigma*, *Ruta graveolens*, *and Grewia orientalis*.

(6) Hosts such as *Acacias* in general, *Pongamia glabra*, *Lantana*, *Cajanus indicus*, *Caesalpinia coriaria*, *Ocimum sanctum*, appear to render sandal highly susceptible.

(7) Susceptibility or resistance depends to a large extent on the nature and root system of the associated

hosts. Hosts with a shallow root system generally appear to induce predisposition whereas those with an extensive and deep root system aid resistance.

(8) Disease transmission is secured only when there is organic fusion of the graft with the stock.

(9) Sandal itself appears to be a powerful denuding agent. Hence sandal : host ratio should be maintained by suitable ,scientific tending to prevent over-parasitism.

(10) Coppiced hosts intensively parasitised by sandal rarely give vigorous coppice shoots.

(11) Frequent scientific tending of Sandal appears to impart a certain amount of resistance.

(12) As the disease is localised in the very early stage of manifestation, girdling and killing the infected part saves the plant.

(13) Pruning apparently healthy sandal forces out masked infection if any, in advanced stages and the tree can be saved by decapitation of affected branches in early stages.

(14) Prevention of spread of spike in an area can be accompanied by the removal not only of spiked trees, but also healthy ones masking infection.

(15) One of the seasons of actual infection in the field is between April and June.

(16) Manifestation of spike generally takes place during the period of vegetative activity (i. e.) from April to June but abnormal factors such as fires, browsing etc., change the season of manifestation.

(17) Primary sites of attack appear to be associated with the degradation of the floristic composition as a result of indiscriminate exploitation, fire, over-parasitisation, over grazing etc.

(18) Lantana is not only an unfavourable host but one which renders the soil toxic to others species.

(19) Root-tissues of spiked plants are not generally infectious whereas the bark and leaf contain the infective principle in high concentration.

(20) The cambium layer is the most susceptible region for infection.

(21) Arsenical preparations are the most effective agents in rendering the causal entity in the entire plant innocuous.

(22) The number of insect scars has been found to be a measure of disease incidence.

Lac, its production, and uses.

By, S. V. Gulvadi,

Madras Forest College, 1931–33 Division.

Introduction :—

Lac is a very important "minor forest produce" of India and has a large demand in other countries. The world's supply of lac is mainly derived from India. It is known that lac has been cultivated in India since very remote times. The total export value of lac from India amounts to several lakhs of rupees, in a year, and at times exceeds that of timber. The provinces in which it is chiefly grown are Bihar and Orissa, Bengal, Central Provinces, Burma, Assam, Sindh, United Provinces, and Punjab. It is also grown in the plains of Central India, Rajaputana by cultivators in their private lands.

Research :—

In recent years much attention has been directed towards research in lac by the Indian lac research Institute, Namkum, Ranchi, (Bihar and Orissa), who issue

bulletins from time to time for the information of the public in general, and forest officers in particular. It is very technical, and more in the field of an entomologist than a forest college student. Yet I have tried my best to make it clear in my humble way in the following pages.

Lac and its production :—

Lac is a resinous encrustration produced by a scale insect called "*Laccifer (Tachardia) lacca.*" It is generally known to be composed of three main constituents besides the dye, namely wax, ether-soluble resin, and alchohol–soluble resin. These constituents are secreted by different glands in the body of the insect. The insect sucks the juice of plants and transforms it into resin which completely surrounds it. It is found only on certain species of trees which are liked by the insects. It is found growing spontaneously on many Forest trees such as :

(1) *Schleichera trijuga* (Kusum),
(2) *Butea frondosa*,
(3) *Zizyphus jujuba*,
(4) *Acacia catechu*,
(5) *Acacia arabica*,
(6) *Ficus glomerata*,
(7) *Shorea talura*,
(8) *Albizzia amara*,
(9) *Dichrostachis cinerea, etc.*

It has been so well established that there are different varieties of lac insects corresponding to different varieties of host plants. Consequently the efficient and large-scale production of lac depends upon the careful selection of the lac insects and the host plant eminently suited for them. It is also recognised that the maximum efficiency of lac (resin) production depends also on season and other climatic factors.

It is also necessary to follow quantitatively the process of lac production during the whole life cycle of the insect with a view to determine the period of its intense activity which is the most critical in the cultivation of lac.

Interesting results have been already arrived at by Mr. Shreeniva sayyain the Institute of Science Bangalore, that the seasonal variation of the rate of lac secretion on *Shorea talura* has been very appreciably different in the three different seasons.

The different hosts were treated with different manures so that it has been possible to see that the resin-producing efficiency of the insect is also affected by different combinations of manures.

It is also interesting to note the lac secretions vary in amount for the two seasons camparatively. Just after the male emergence it will be seen that the maximum amount of lac is built up within one month in case of *Kartiki* (winter crop) whereas in *Baishakhi* (summer) crop it would take a much longer time to put forth the same amouut.

Though the duration of the life cycle of the insect is very different in the two seasons, the period of vigorous lac production seems to be practically the same in both the cases.

The delay in the maturity of the long season crop is therefore expected to be due mainly to the dormant condition of the host over part of the season and partly due to the inactivity of the insect before larval emergence.

Life history of the insect :—

The fully developed fertilized female insect gives birth to hundreds of young pink coloured larvae within a course of two or three weeks. These soon after their emergence, settle down on young and succulent twigs of

the host tree. There are both male and female among the larvae; within about three months from the date of emergence the insects become sexually mature.

The males emerge out of their small resinous cells, fertilize the female and die in a short time.

The female insects then begin to grow faster, their resinous encrustations developing thickly together, so that when they are fully developed a healthy growth often reaches the thickness of 1 to 1½ inches.

It is only the female insects that yield the marketable lac. At the end of the season again the tiny larvae swarm out of the mothers and the life cycle is repeated, twice in a year. The mother insects die at the end of the season, i.e. after the larvae have swarmed out.

There are therefore two crops in a year, *Baishaki* or summer crop and *Kartiki* or winter crop. Of these only one succeeds commercially in many of the lac growing areas.

Description of the 1st stage larvae :—

The newly emerged larvae of the common *ber* brood are crimson in colour elongate-oval in shape, tapering from the anterior to the posterior extremity The posterior end of the male larvae is narrower than that of the female and tapers more sharply from the brachial region. The larvae measures from 0.575 to 0.625 m. m. in length and 0.2 to 0.25 m. m. in breadth. In the *Kartiki* crop the male larvae after fixation grows in length and breadth during the first two weeks and moults for the first time in the 3rd week thus losing its legs antennae and apical hairs. In *Baishakhi* it moults for the first time from the 7th or 10th week.

Sex identification :—

From the above conclusions it is abundantly clear that the lac cultivator should be able to identify the sex of the insect even before maturity.

Mr. Carter was the first to attempt sex identification of the larvae shortly before maturity. After him Roxburgh was the first to mention about a female crawling larvae being distinct from the male. Mr. Macker who cites Carter as the source of information on the biology of the insect, says that the male and the female larvae are identical in shape and size. Messrs Stebbing and Gwatt say that at this stage it is impossible to distinguish the sex.

External resinous developments from larvae to adult :—

Mahdihassan is the first worker who has systematically studied the resinous developments in the first few larval stages. He undertook to find the sex ratio prior to maturity, having failed to distinguish, at first a newly emerged male larva from a female one. Mr. Pratapsingh Negi took up the work in 1926 and he fully agreed with the former.

The larva has a dorsal shield of wax on its back which never disappears but undergoes systematic changes in shape in accordance with the growth and the secretion of resin. The growth of the male larvae differs from that of the female from the very start.

(1) The male larva grows longitudinally and the female vertically to the plane of attachment.

(2) The male larva secretes less wax and resin than the female even in the first or second stages when both are feeding, with the result that the colour of the male tests of the larval prepupal and pupal stages is always brighter than that of the corresponding female. The larval resinous developments were studied during the winter crop in four broods.

(1) Jodhpur yellow *ber* lac (on *Zizyphus jujuba*) (2) *Butea frondosa* (3) *Schleichera trijuga* (4) common crimson lac on *ber*.

Fundamentally the growth in all the four broods was the same but differences occurred in the time of moulting of the male and female larvae of different broods and the time of reaching maturity. Accordingly the external resinous developments varied in some respects in their appearance.

The Jodhpur yellow *ber* lac insect which occurs with the crimson variety in a particular locality of Jodhpur secrete a beautifully yellow lac resin; which if it yielded a superior shellac would be much appreciated by the manufacturers.

It should be remembered that the external resinous developments are strictly related to the matamorphosis in the developing larvae, which seem to depend on the supply of food, climatic conditions, host plant and manurial treatment. It has been noticed that the development in *Kartiki* crop is quicker.

At Mathurapur, Malda District, Bengal, which is hotter and damper than Ranchi, the emergence of males in 1926 began in the fifth week i. e. just a month after inoculation.

Collection of crop :—

It will be seen from the above statements that it becomes incumbent on the cultivators in their own interest to allow the full development of the mother on the host plant and to remove the crop (especially that portion to be used as brood lac) not more than 8 to 12 days prior to the emergence of larvae. The embryo has reached this full development by this time and the mother thenceforward busies herself in making preparations for delivery. This should allow sufficient time for big cultivators to arrange for the necessary labour and transit. In addition cultivators and wholesale buyers get another 3 to 6 days after emergence has begun for

the swarming of the larvae giving a total period of a fortnight to make all the necessary arrangements for starting the brood on the tree.

The cultivator should remember that it is extremely harmful to remove the brood lac earlier than the period mentioned above, because the mother does not get the full nourishment and though the embryo develops even if the brood lac be removed a month and a half before the emergence of the larvae, the mother's vitality without food goes down considerably and it makes her unfit for the delivery of hundreds of young ones.

Hence the result in such cases is either that the mothers die without delivering a single young one or deliver only a portion and these too having low vitality. So that when they fix themselves on the plant they die soon.

Method of artificial infection :—

It is a common experience that the self inoculated plants of lac are usually infected by predacious moths and parasites. Therefore it is always safe and profitable for the cultivator to use the method of artificial infection. This consists as follows :—

When the females are fully developed in June and November the incrusted twigs of 6″ to 9″ length are removed from the tree about 10 to 12 days prior to larvae swarming and tied in bundles of two or more flush with the succulent shoots of the pollarded host. The tiny red larvae emerge out of the brood sticks almost every morning for about three weeks and settle once for all on the host plant. When the larvae swarming ceases the brood sticks are removed and the lac scraped off. This is the crude lac. The insects thus settled on the new hosts propagate on it and in their turn produce lac. The over infected branches are removed from the host for infection in the succeeding season.

Effects of sudden cold on the emergence of larvae :—

Sudden cold has a tremendous effect on the emergence of larvae. It was noticed in several cases that if the emergence of larvae from certain female tests had just begun and sudden rain and cold occurred emergence stopped for a time. If the weather continued to be unfavourable for two or three days, the larvae also generally cease emerging from the mother.

Its enemies :—

Lac insect is not without its enemies or predators such as a certain moth and a kind of ant. So success in the lac cultivation depends much upon the absence of predatory insects. The greatest enemy of the lac insect is the moth "*Eublemma amabilis.*" It is a noctuid moth predacious on the lac insect. It does more injury to lac than any other single species of predator and parasite of lac. It has six generations in a year and does more injury to the *Kartiki* crop (which is usually more important commercially) than to *Baishaki.* The predator has several natural enemies. But it can be controlled by either physical or chemical measures.

Physical :—

(1) The portion of crop used as brood lac for infecting the plants, should be kept under water from 6–10 days immediately after all the lac insect larvae have emerged from it and the rest of the crop must be treated similarly immediately after it has been reaped.

(2) Selected and as far as possible parasite–, and predator-free, brood should be used for every crop. Self inoculation should be avoided.

(3) *Kusum* brood should be avoided to inoculate other host plants (excepting Kusum) for *Kartiki* crop. This will save the destruction of lac insect by the

predators and parasites for a further three months i. e., November—January, and will also check the further multiplication of the predators and their attack on the *Baishakhi* crop.

Chemical :—

The portion of the crop as suggested above should be fumigated with carbon bisulphide at the rate of one oz to 10 c. ft. of space.

Ants in general are not injurious to the lac insect. But some species undoubtedly pick up the crawling lac larvae and the male insects. At the same time all of them are useful to the insect as they remove the excreted " honey dew " which otherwise mixed with dust in the absence of rains is likely to block up the respiratory organs of the insect and cause its death by suffocation. In addition many of these especially *Componotus compresses* (a variety of ants) help the lac insect by feeding on the predator moths.

Cheap mollasses can be used with advantage to prevent the access of these ants to the lac insect in places where they are suspected of being harmful chiefly at the time of larvae and male emergence. By these means alone the lac cultivator is sure to raise his yield of lac by about ¼″ each crop.

Value and uses of lac :—

The price of lac fluctuates like all other commodities, but during the last war it went up to Rs. 285 per maund of 82 lbs. Normally a maund of crude lac fetches about Rs. 60.

The chief uses of lac are :—

(1) For the manufacture of varnishes aud paints. (2) For the manufacture of gramaphone records. (3) For making lacquer work toys, bangles etc. (4) as an insulating material in electrical works. (5) For silvering the

backs of mirrors. (6) For sealing wax and lithograpic ink (7) Stiffening material in the manufacture of silk. (8) For painting bottoms of ships to prevent the corrosive action of salt water on the steel plates; encasing cable wires, etc.

Our experiences with the hedge and edge (border) plants tried on the Forest College Estate, Coimbatore.

By, "COMMIPHORA."

The purpose of this article is not to give a catalogue of the hedge and the border plants that might be tried in a place like Coimbatore, but to present briefly the degree of success we were able to achieve with the species we tried. It is possible that we have not exhausted the list of suitable species, but we hope we have spared no pains to grow as best as we could, what we thought most suitable for our locality.

The natural soil of the estate is stiff black-cotton all over, to an average depth of about two feet, with a *Kankar* bed of varying thickness underneath Added to the poverty of such a soil is the meagre rainfall, the average annual precipitation being not more than about 25 inches. Our choice of species was therefore very limited. Those tried are detailed below in the order of success or suitability :—

A. Hedge plants :

Except for *Pithecolobium dulce*, and *Cassia siamea*, neither imported soil nor manure was used for the hedges. For the first few months watering was done once a week till the plants established themselves. Further details will be found in the notes on the respective species.

1. *Agave vera-cruz* :—

Tamil : Anaikkatrazhai. *Telugu* : Rakshimattalu. *Kanarese*: Rakshasabale. *Malayalam* : Panamkatrazha. *Hindustani*: Barakanvar.

This is an American plant cultivated and naturalised in various parts of South India and chiefly in Coimbatore; often found as a hedge plant along railway lines, and thriving well in open places.

It appears as a gigantic bulbous plant with perennial aerial, generally short stem, and perennial large lanceolate stiff, thick, glaucous, spine-tipped and spine-edged leaves (3 to 4 ft. long and 4-5 inches broad) which form a large rosette. After flowering, the shoot with the gigantic inflorescence dies, but the subterranean lateral shoots survive and reproduce the plant.

This hedge planted about seventeen years ago continues to form an efficient defensive barrier for the northern boundary of the estate, a mile long. As 'bulbils' are not produced by this speices, it was planted and propagated by means of suckers. Since the planting of the latter on the native soil—without any addition of red-earth or manure, watering was done once a week for about two months, by which time they got established fairly well. Though the Agaves cannot be trimmed so as to present a neat flat top, the general appearance cannot be described as ugly, nor is the protection insufficient.

2. *Commiphora berryi*, Engl.
(= *Balsamodendron berryi*, Arn.) *Tamil* : Mul-Kiluvai.

Nearly as hardy and protective as the above *Agave*, is *Commiphora berryi*, Engl., described by Gamble as occuring in the " dry forests of the North Coimbatore hills, planted to make hedges from thence southwards in the Carnatic ; Tinnevelly district (Barber) ".

It grows to a good sized tree, with many sharp spines on the branchlets. A slightly aromatic resin is exuded when the bark is wounded. The tree is easily propagated by cuttings.

*Cuttings about 4 ft. long, and varying in thickness from $1\frac{1}{2}$ inches to 3 inches were obtained from Tadagam valley (Coimbatore district), and planted, at the break of the south-west monsoon, on the native soil—without any dressing—and watered once a week, for a month. Shoots appeared on the cuttings three weeks after planting. The bigger sized ones sprouted quicker and in greater numbers than the smaller ones, and the casualty on the whole was not more than 25%.

The prickly pear which protected more than half a mile of the west boundary of the estate having been exterminated by the *Cochineal* insects last year, a new hedge of *Commiphora berryi* was started some six months ago, and shows promise of making a strong barrier in the long run, but the growth seems rather slow. Better growth seen elsewhere in this district, is accounted for by a better quality of soil—red loam. In order to make a hedge of this species thick enough, it is advisable to plant the cuttings alternately in three or four rows. Though somewhat more protective than less hardy species like *Pithecolobium dulce* (See No. 4 below) it is not half as handsome, owing to its having more thorns than leaves, but in a dry locality like Coimbatore it is a God-send to agriculturists and others wishing to replace the prickly pear fence (now nearly wiped out by the cochineal insects) by a suitable one.

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* The bigger sized cuttings not being spinescent are not unlike those of *Commiphora caudata*, Engl. (=Protium caudatum, W. & A. Tamil : Kiluvai). The latter also makes a good hedge but is not so efficient as a defensive barrier, being devoid of thorns. It is also easily propagated by cuttings. The bark of *Commiphora caudata* has a characteristic smell of mangoes and enables one to distinguish it from cuttings of *Commiphora berryi*, Engl.

3. *Thevetia neriifolia*, Juss.—(Thevetia : After A. Thevet, French monk who travelled in Brazil.) (*Tamil* : Pon-arali.) This is an erect milky South American shrub or small tree with dark green, linear, alternate, sub-sessile, leaves, 4–6 inches long, with a prominent midrib. As B.S. Nirody observes, this "oleander-like, shiny leafed bush with fairly showy yellow* flowers is of exceptional merit, and its highly ornamental qualities and hardy character make it valuable as part of the landscape features of the garden in a variety of situations, but its highest value consists in its being almost ideal for screen-planting and affording an excellent setting as a back-ground for masses of bright-coloured flowers such as Cannas. It is easily raised from seed in the rains, but though somewhat slow at first, it makes rapid growth as soon as the plants have taken a grip on the soil."

This has been tried for screen-planting and for ornament, with encouraging results at the east end of the estate, and elsewhere in gardens in certain bungalows. Experience points to the necessity of close planting and constant pruning from the early stages, so as to avoid gaps especially near the ground-level. In fact, this applies to the other hedges detailed below, and to nearly all *border* plants as well.

Hedges of *Thevetia* that were started on the college in recent years and that could not be given the requisite watering and shearing owing to increased financial stringency, necessarily developed some big gaps near the ground level. To fill up these a second hedge of Aloe had to be formed.

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* We have on the estate a variety of *Thevetia neriifolia* with corn-coloured or buff-coloured flowers.

4. *Pithecolobium dulce*, Benth.

(=*Inga dulcis*, Willd. *English*: Manila Tamarind; Madras Thorn. *Tamil*: Korukapuli. *Hindustani*: Vilayati-imbli. *Pithecolo-bium* Greek: *monkey* and *ear-ring*, alluding to the circular pods; *dulcis*: sweet.—the white aril of the seeds being so.

A moderate sized fast growing evergreen tree introduced from Mexico, and extensively planted as a hedge plant, and run wild; armed with straight stipulary thorns. Leaves bipinnately compound with only one pair of pinnae, each with a pair of obtuse coriaceous unequal sided leaflets 1–2 in. long, the main and the secondary rachis terminating in short bristles. Flowers in heads arranged in long panicled racemes. Pod twisted, coriaceous, with seeds having a massive whitish edible (sub-acid) aril. As B. S. Nirody observes, this is "famous throughout the tropics as an ideal hedge plant......., and has its merits and demerits. The former are that it is easily raised from seed which is cheaply obtained in bulk, grows quickly, stands any amount of close and persistent shearing, and is therefore extremely attractive when neatly trimmed to the desired shape. It is also thorny and fairly drought-resistant, and in upper India it is all the more valued because it is resistant also to light frosts. But its drawbacks are that it requires constant attention in the shape of shearing almost every month, becomes leafless and unsightly at the base if neglected even for a short time, and the leaves are attractive fodder to cattle. As a sheared hedge it also needs occasional watering in the summer".

For this hedge, the ground was trenched about a couple of feet wide and as deep and given a sprinkling of manure. Watering was done thrice a week for a month. It was not a failure on the College estate, but in recent

years it has been found increasingly difficult, owing to financial stringency, to pay the necessary attention to to the long lengths of the hedges, in the shape of frequent shearing, and even an occasional watering in the hot months. For a rather exacting hedge of this kind, its present condition on the estate is far from unsatisfactory.

5. *Cassia siamea*, Lam.

Tamil : Manja-Konnei. Country of origin : East Indies and Malaya.

A middle-sized evergreen tree of " Carnatic, from the Shevroy Hills southwards—common in forests (Beddome). Much planted in avenues etc., and now naturalized."—Gamble. Branches virgate, downy and terete. Leaves; 6—12 inches long, pinnate, without glands. Leaflets 6—12 pair, 1½ to 3 inches long, oblong, emarginate, shortly mucronate. Flowers yellow, in corymbose racemes. Fruit 6–9 in., long, ½ in. wide with thickened sutures. Easily propagated by seeds.

The ground was trenched about 2 ft. wide and as deep, and filled with a compost of three parts of red earth to one of the native soil (black cotton soil), with a sprinkle of leaf-manure. Watering was done as for No. 4, but the shearing needed was less frequent. The growth seems much quicker than in the case of No. 4, tried under similar conditions. Hedges of *Cassia siamea* grown on untreated soil on the estate show a growth nearly as quick and good as those on the red soil, and that it is less exacting than species No. 4. The latter however is more protective in that it is spinescent, and is certainly more attractive too, though a more frequent shearing is needed for it.

6. *Caesalpinia coriaria*, Willd.

English : The Divi-divi. *Tamil :* Kona-puliyan. A small unarmed tree of South America, cultivated for

its pods. Leaves, 4–5 in., bipinnate, pinnae 7-9 pair, leaflets 25-30, very minute ($\frac{1}{4}$ in. long). Flowers: small, very fragrant, in dense short panicles. Pod thin and much twisted.

Seeds were sown on the native soil after hoeing. Watering was done as for No. 5. The growth is not found to be quick enough. Hedges of *Dividivi* maintained on a small scale in bungalow-compounds on the estate, and raised on manured soil and watered more frequently are no doubt very attractive and leave nothing to be desired.

The following were among the species tried and given up as unsuited for conditions obtaining on the college:—

(i) *Bougainvillea glabra:* This is described by B. S. Nirody as " one of the best hedge plants for this part of the country for a strong defensive boundary because it is woody, fairly quick-growing easily rooted from cuttings in the rains, makes good growth even on poor soil, and does not require watering in the summer after the second season from planting..............." Our experience based on a number of trials is rather to the contrary. The species seems to be more exacting than it is described to be.

(ii) *Caesalpinia pulcherrima.* (The peacock flower.) This seems much less exacting than *Bougainvillea,* and has not been planted on a large scale on the estate as more hardy species are already available. On a limited scale, however, in bungalow compounds on prepared soil and with facilities for frequent watering this species is particularly to be favoured, as its utility as a hedge is enhanced by the unending supply of cut-flowers it produces.

(iii) *Duranta plumieri* : The remarks on the Peacock flower apply equally well to this species, much esteemed for its pretty lilac or white flowers in long sprays useful for the vase. *Duranta* is particularly suited when a hedge is to be formed in a shady place as it stands shade upto a considerable amount.

Punica granatum (Pomegranate) and *Lawsonia inermis* (Henna) were not tried at all, as they were thought too exacting. Perhaps *Dodonea viscosa* could have been given a trial.

B. Edge or border plants :

For all the border plants grown on the estate the ground was trenched 1 ft. broad and 2 feet deep and filled with soil, two parts of red earth to one of black soil, and given a sprinkle of leaf-manure.

The species tried are given below in the order of success or suitability :—

1. *Eupatorium heteroclinum*, Griseb. (Compositae).

A very hardy plant from *Jamaica*. Leaves : 1-2½ in. by ½–¾ in., opposite, lanceolate, serrate, with a pungent smell when crushed. Flower head rayless, florets with long, *lilac*, stylar branches. It is easily propagated from cuttings, which root and get established in two to three weeks. The cuttings are best planted at the beginning of the North east monsoon, in six to nine rows, and shaded by a 'pandal.' A cheap and still efficient way of shading is to plant big leafy twigs here and there in the trench, and remove them after the rooting of the plants.

This seems to be the most hardy and suitable border plant for the college estate as very little watering is needed after the establishment of the cuttings. The more frequent you trim it the more attractive it becomes, the leaves also tending to get smaller, after the clippings.

Except in the hot weather, the border presents a very pleasing apple-green boundary. Perhaps we have been rather ambititious in having tried it for bordering too great a length of roads to be well maintained under the conditions obtaining here. Experience has pointed to the necessity for us, of restricting the live borders to flower beds, and replacing, if necessary, those for roads, by white washed bricks or tiles or long earthenware pipings (half-pipes) as at Bangalore and elsewhere.

(Note : *Eupatorium glandulosum*, H. B. K., with *white* flower heads, is the ' Ooty-weed ' forming a dense undergrowth in many parts of the Nilgiris).

2. *Justicia gendarusa*, *L.*

(*Tamil* : Karu-notchi. *Telugu* : Nalla-vavili). An erect undershrub with subsessile, lanceolate, glabrous, leaves upto 5 in. long and 1 in. broad. Flowers white or rose with purple spots.

This border requires more frequent watering than the *Eupatorium*, and has been tried only in bungalow gardens. The leaves being bigger than those of *Eupatorium*, the edges of this border are not so sharp as in No. 1.

3. *Telanthera ficoidea*, Moq.

(Commonly called *Alternanthera amabilis*).

Tamil : Ponnanganni–Keerei. This is a small S. American prostrate plant commonly used for " carpet-bedding. " It is specially favoured by gardeners for lettering, and ground designs of various kinds including figures of animals. Leaves : Spathulate, and tapering to a long petiole, opposite, 1-2 in. to $\frac{1}{3}$-$\frac{1}{2}$ in. They eventually turn a crimson colour, or become veined and blotched red and orange. In some varieties the bottom of the leaves is crimson while the top is green.

As this is found to be exacting in its water requirements, it is restricted to flower beds in front of the college, and in bungalow compounds.

Other border plants like *Lochnera rosea* with pink flowers, *Pedilanthus tithymaloides*, Poit., a fleshy American shrub with stout dark-green branchlets, and red or orange flowers, *Euphorbia pulcherrima*, Willd, the Poinsettia, the Mexican plant with large bright crimson floral leaves, and species of *Eranthemum* have been confined to gardens of residential quarters on the estate, their extension on a larger scale being ruled out by considerations of economy.

EXTRACTS.

I. Plant Indicators :

Every year the British forester is faced with the problem of which species to plant, and now that we have such a wide range of species from which to select, the choice often becomes embarrassing. Not only heave we to choose between hardwoods and conifers, or the two mixed together, but we have to decide which of each kind to plant. The choice, too, may be further complicated by the variety of objectives which the planter has in view, as, for instance, when a desire to improve sport and amenity is superimposed on the need for financial profit.

But, whatever may be the aim of the planter, his plans are bound to fail unless the species which his ultimate selection includes are sufficiently adapted to the soil, climate, and aspect to thrive in the positions where he plants them, and a large part of the skill of the planter consists in knowing beforehand which species will succeed in each part of his woods. Such knowledge is gained from many sources of which the most important is the previous cultivation of the species on similar sites. But many of us have to plant areas which have not previously carried crops of the species which are now most commonly used, and we have to fall back on our general knowledge of the requirements of each species and the types of situations in which it prospers.

In this respect botanical science is coming to the help of the forester. It is found that the character and quality of the site as a medium for tree growth is most accurately determined by the natural vegetation which is growing there. We may use the weeds as indicators of edaphic and climatic features, and can learn from them the kinds of trees which may be planted with more certainty than we can judge by direct observations of soil and climate. Some weeds are of little use as indicators, because they are so tolerant that they will grow almost anywhere. Others are very selective, and their presence indicates with considerable precision the character of their environment. It is these selective weeds that are most useful to foresters.

The most famous work on the use of indicator weeds in forestry is that of Professor Cajander in Finland. By means of detailed botanical surveys Cajander was able to differentiate in Finland a number of " forest types, " which he named after the species which were most sufficient in them. He even went so far as to formulate, with the co-operation of Y. Ilvessalo, yield tables for pine, spruce and birch, in which the quality

classes were based on vegetation types instead of (as in the case of the British Yield Tables) height growth, and in Finland land-owners are now taxed on their woodlands according to the quality of site which is indicated by the wild plants.

British botanists have also collected a considerable amount of information on indicator plants, but this information has been scattered and needed co-ordinating in order to become of practical value to foresters. This co-ordination has now been undertaken by Dr. M. L. Anderson, who has condensed into a small pamphlet all the salient facts gleaned from other writers, and has included the results of his own wide experience.

The pamphlet may be divided into three parts; the first is the classification of the natural woodlands of Britain; the second a classification of the waste land types; and the third a classification of tree species for afforestation purposes.

In the classification of natural woodlands, Anderson has followed the work of Moss, Rankin and Tansley as far as England is concerned, and he has added a few communities which are more typically Scottish. British woodlands have been so alterated by human cultivation and destruction that it is defficult to distinguish natural indigenous types from those types which are the result of cultivation. But, by careful examination of the whole vegetation contained on an area, a field botanist can generally recognise it as belonging to some accepted type. Anderson recognises fifteen woodland types of this nature, dominated by ash, oak, birch, alder, rowan, aspen and Scots pine, or mixtures of these species. The only one of these communities which has been studied at all intensively is the climax Beechwood Association which most foresters recognise as a very distinct type. Most of us have to deal with associations where oak appears as the natural dominant, and most of us would be entangled in difficulties if we had to say whether our oakwoods belonged to the Ash-Oakwood Community, the Moist Oakwood Association, the Dry Oakwood Community, or the Oak-Birch Community.

The classification of waste land types is of particular value to those who are planting up waste in contradistinction to old woodland. Seventeen types of waste land are recognised, many of them of a swampy or very dry character, some of which are unsuitable for planting at all. These communities are recognised by the dominant species which are present, but it is interesting to note that bracken is not recommended as a suitable indicator since it is so tolerant that it grows in a large number of communities which should be distinguished from each other by other plants.

The classification of tree species for afforestation purposes is arranged so as to be directly applicable to the planting of bare land, and when the ecological class of any area of bare land has been determined, a list of suitable species for planting on it will be found at the end of the pamphlet. These species are marked so as to enable us to recognise whether they are (1) storm resistant or non storm resistant, and (2) frost tender or frost hardy.

If a forester uses the pamphlet, it is essential that he should know the commoner types of wild plants, and it has already come to be recognised that field botany must have its place in the curriculum of every forester's training. Among the most valuable indicator plants are some of the commoner mosses, and foresters would welcome the publication of a small practical book on the identification of these plants.

The only fear which may be entertained about the use of this exceptionally interesting pamphlet is that it may tend to make the choice of species almost too automatic. The plant associations which are to be found in Britain range into each other in an imperceptible manner, and any classification of communities is bound to be to some extent artificial. For this reason foresters must be wary and must always be ready to diverge from the recommendations which are laid down in any book if their own experience leads them to mistrust them. Subject to this warning the use of an ecological classification is to be warmly recommended, and the time may not be far distant when no forester who cannot use such a classification will be considered worthy of his profession.

—Quarterly Journal of Forestry, Oct: 1932.

2. Wood Preservation :

" Relative economy of treated timber structure " was the theme of an interesting address delivered at the Engineering College, Guindy, by Mr S. Kamesam, Wood Preservation Expert, Forest College, Dehra Dun, before a large gathering of students and professors of the college. In the course of his lengthy address he said :—

The forests of India contain some of the finest species of timbers in the world. While the countries and continents like the United States of America and Europe possess, and have to be content with using practically only softwoods for structural purposes like railway sleepers, highway and railway bridges, railway wagons, wharves and piers, foundations, poles, cross-arms and insulator pins for electrical construction etc., we have in this country several timbers which are nearly twice as strong

as those in Europe and the States. But the question is, "Have you used these timbers"? The next question is, " If you have at all used them, have we really used them or abused them "? Referring to some of your Madras timbers like Karimaradu, yegasi, poon, sal and others, they are pre-eminently suited for structural work. These timbers have been given the unjust appellation of " junglewoods "—they are the " depressed classes " while naturallv durable timbers like teak and deodar are the " mandarines " of Indian timbers—they are the Brahmins and the Kshathriyas. In the past, whenever, " jungle-woods " have beon used in India, they were employed without being preserved with their inevitable failure in a few years. Hence the prejudice against them. We have misused them and so we are responsible for the poor results. Let us see how these junglewoods, these " depressed classes " of our forests, a number of which are considerably stronger than teak and deodar while costing about a third of the cost of teak can, with very little expense and trouble, be even made to surpass teak and deodar in economy and durability. This brings us face to face with two questions. The first is naturally. " What is the mechanism by the application of which the qualifying word jungle for junglewoods can not only be deleted, but can be replaced in most cases by superior ? To this, I answer that it is by preserving or " pickling " with chemicals the so-called " junglewoods " that their durability can be enhanced to practically any degree, without any reduction in their strength. The preservation of wood is the keystone of the arch supporting rational and efficient wood utilisation practices. The acquired durability of junglewoods by wood preservation can be made easily and economically to exceed that of teak or deodar. When one remembers that the cost of such a favourable metamorphosis is only of the order of 1½ or 3 annas per cubic foot of wood, one will certainly realise that there are vast potentialities not only for the use of " junglewoods " of India which cost about 4 to 5 rupees less than teak per cubic foot—but for the use of treated timber structures in the various public utilities of our country.

Economy in Wood Preservation.

The second question is when once we preserve these so-called junglewoods, what are we going to use these woods for ? Here we touch one of the most important economic questions relating to our country. The major proportion of the forests of India as well as the great public utilities of the country like the Railways, Posts and Telegraphs, Public Works, Ports and Harbours etc., belong to the tax-payer. Since both the Govern-

ment and the people have been ignorant of the potentialities of chemically treated timber till recently when several experiments started by the Government has given definite indications and results, not only the larger proportion but the more important quota of India's timber resources have remained buried, untapped and unappreciated. Madras has quite a large share of these species which it hardlv pays at present to convert. My aim and ambition—nay, my mission in life I may confide to you—is to salvage these depressed classes of Indian timbers from their obscurity and seat them on the high pedestal of structural materials that, by right, belongs to them. A systematic, extensive and efficient utilisation of our so-called junglewood resources, —ignoring teak altogether—in our public utilities will not mean less initial as well as ultimate expenditure to our great public utilities and hence to the Government but will result in enhanced income for the State-owned Forest Department, especially for the Madras Forest Department which has in its forest very few timbers which are acceptable without chemical treatment for railway sleepers and other purposes. Hence an extensive utilisation of treated timber structures in the Railways, Telegraphs, Telephones, Electric transmission, distribution and lighting schemes, Public Works, etc., will be a double gain to this country.

The timber resources of this country belong to the tax-payer so that an extensive use of them connotes a double gain. It is cheaper in initial cost and maintenance, etc., to protect wood from fungi, white ants, and insects than steel from rusting, corrosion, etc. The protective chemical in the case of wood can penetrate into it for a considerable depth in most cases, so that either by the action of the elements or due to such machanical causes as abration, etc.,the protective effect of the chemical in wood is not easily dostroyed whereas with iron or steel structures, there is but a veneer of protection obtained by painting or galvanising, and in the case of painting, it has to be repeated often, once every two years. Wood when once properly impregnated with a wood preserving antiseptic need not be protected again by painting, etc. A really water retarding paint like aluminium paint if used for steel costs considerably. You observe the state of the Napier Bridge near the Marina which is going to pieces in spite of painting it twice every year. With a treated wood bridge, you need not paint it even once in twenty or thirty years. As regards galvanising, in wet climates and for several important structures, its efficiency has not been vindicated. Engineers are learning that concrete has to be painted and made water proof to get the best results out of it.

Advantages of Treated Timber.

One of the great and special advantages of treated timber for structural purposes in this country is that the erection of structures made with it can often be done with a minimum of special plant, tools, etc., and of supervision and employing the uneducated but clever Indian wood-workers, obtainable on the spot for probably a rupee per day of ten working hours when you have to pay in America for a similar wood-worker about two and a half to three rupees per hour.

Mr. Kamesam next dealt with his scheme of treated timber structures and their relative economy for Indian conditions.

India's Wealth in Wood.

Concluding Mr. Kamesam said, while in the other civilised countries of the world, over 90 per cent of the timber utilised for structural purposes is from trees below 18 to 20 inches in diameter, in India, due chiefly to the ignorance of the average engineeer in India of the full potentialities of wood preservation, the State Forest Department in India obtains comparatively very poor royalty from trees of the smaller size even of teak, sal and deodar as the major portion of such trees consists of the nondurable sapwood. If we are to secure optimum conditions for timber utilisation in India, we ought to have a definite programme of utilisation for tree stems of our commercial trees from 5 inches up to 20 inches in diameter. We can get practically all the dimentions we want for structural timber from these sizes which are crying, in vain, for utilisation. If a proper response is made and an efficient organisation to deal with the question is inaugurated a shorter period of rotation for the different species may conveniently be adopted, as trees above 18 inches or 20 inches in diameter will be then a costly luxury, as they are considered in Europe to-day; this gives a different orientation to the forestry aspect of Indian timber utilisation and its economics in general. If India is to come into line with the civilised world in the matter of timber utilisation, she must not depend for structural timber, like railway sleepers, on trees over 20 inches in diameter, *and* she should be able to utilise poles below 12 inches in diameter up to 5 inches for electric transmission and distribution purposes, telegraph and telephone poles as well as for piling for trestle bridges or for marine purposes, while those trees or tree portions between 12 and 18 or 20 inches in diameter should, in general, he utilised for sleeper conversion.

I appeal to you and to your engineers to dispel the present attitude of disregard for the intrinsic value of structural mat-

erials. Let not the accident of an earlier and more efficient propaganda and organisation of the steel and cement industries delude you—nay deceive you. Organise the wood preservation industry and you have a perpectual supply of splendid material that is yours and can hold its own for several important engineering structures, against any other structural material including steel and concrete, for economy consistent with efficiency. Make by wood preservation one tree serve the purpose of three trees. A tree saved is a tree grown. Make a beginning, overcome the starting friction, and the promised land is not for away.

(After the lecture, Mr. Kamesam answered a few questions. Replying to questions regarding his method of treatment of wood, the lecturer said that his method was to inject arsenic in wood in a certain definite proportion. By this new process timber could be preserved for about 20 years. The cost involved in his process was cheap; it would cost only one anna per cubic foot. He also stated that the timber preserved by his process could be utilised for marine structures.)

—*The Hindu, 8–9–32.*

3. Empire Fibres for Rope Manufacture:

For many years past the ropes used by sea-going vessels have been made largely of the fibre known as Manila hemp, some 50,000 tons of which, of an approximate value of £ 1,500,000 are imported annually into the United Kingdom for this purpose. Much of this fibre could be replaced by the Empire-grown fibres such as Sisal hemp and new Zealand hemp, if these should prove suitable for use in this way. During recent years the production of Sisal hemp has undergone great development in British countries, especially in Kenya and the Mandated Territory of Tanganiyaka, and its employment for marine ropes would provide an outlet for the large quantities produced. Some years ago when the question of the utilisation of the fibre for this purpose was under consideration at the Imperial Institute, it was found that there was an impression prevalent that Sisal hemp was unable to withstand the action of sea water but rapidly suffered a loss of strength. A series of trials have, therefore, been carried out by the Imperial Institute during the last six years in order to study the durability of Sisal hemp and New Zealand hemp in comparison with Manila hemp. A number of ropes of Manila hemp, Sisal hemp and New Zealand hemp respectively were made according to the same specification and were exposed to the action of sea water, under precisely the same conditions, by placing them in wooden crates fixed to Southend pier in such a position that during each

tide they were completely submerged for a period and completely uncovered for a period. The strength of the ropes was determined before immersion and after definite periods of exposure to sea-water. The Imperial Institute has now completed the fourth series of tests carried out on these tines and the results are recorded in a report published in the " Bulletin of the Imperial Institute" (No. 2 of 1932). They corroborate those of the earlier series in demonstrating that ropes composed of Sisal hemp or New Zealand hemp resemble Manila hemp ropes in their resistance to sea-water and are capable of maintaining their strength to a similar extent. The establishment of these facts has encouraged the Admiralty and certain shipping companies to carry out practical tests on sea going vessels with ropes made from British-grown Sisal and New Zealand hemp, and the results are awaited with great interest.

—*Journal of the Royal Society of Arts.* August 12, 1932.

4. Cashew Industry in South India :

The cultivation of the Cashew tree (*Anacardium occidentale*) has been given an impetus within recent years by the great demand for the kernels in the New World. The tree grows wild, quickly and luxuriantly all over the West Coast tract. The demand for the produce of the tree is likely to increase very rapidly as in addition to the kernals some by-products are also produced such as an oil from the shell and alcohol from the fruit juice. The industry has begun to increase in magnitude in Mangalore where there are a few firms doing large business in this line. Exports are chiefly to American markets. The Government of Madras have encouraged this industry by planting a small area of this crop in the Coconut farm at Nileshwar. A good deal has to be studied with regard to the tree in its various aspects and it is hoped that further detailed particulars may be had in this direction after the experiments have produced results.

—*Madras Agricultural Journal Feb: 1932.*

5. Olympic Games :

Twenty New World Records :—

Los Angeles makes History.

The Tenth Olympic Games which concluded at Los Angeles resulted in the establishment of 20 new world records and 31 new Olympic records (writes " The News of the World ").

Fifteen of the world records were in the athletic events including the 800 meters record of 1 min. 49 7/10 secs. set up by T. Hampson, the British champion.

Five new world records were broken in the swimming events. The New Olympic records included 22 in the athletic events and nine in the swimming.

About 100,000 spectators, more than had gathered on any one day of the Games, attended the closing ceremony. It concluded in the pomp and splendour which it had begun.

It is estimated that during the fortnight fully a million people watched the various contests. Of these 600,000 alone attended the opening and closing ceremonies and the athletic events which were held in the giant stadium.

The gate receipts amounted to nearly £ 500,000.

Unofficial scores (European system) are :—United States 40, Italy 11, France and Sweden 9, Hungary 6½. Japan 6, Finland 5½, Britain 4, Argentine 3, Poland, Ireland, Australia, Holland, Germany, Canada, and South Africa 2 each, Czecho—Slovakia, India and Austria 1 point each.

—*The Hindu.*

6. Are wild elephants ferocious ? :

Some popular myths exploded—BY " A JUNGLEWALLA."

It is curious what fantastic stories persons who have never been inside a forest circulate about the elephant in its wild state or any other untamed animal............I will here confine myself to exploding some popular myths about wild elephants which I have seen so often and at such close range in my peregrinations in impenetrable forests.

Many persons take it for granted that a wild elephant charges any and every harmless fellow who happens to cross its path. To disprove this fallacy, I will just say one thing: it will be the easiest thing for a newly caught elephant within the *khedda* to knock off the mahouts sitting on the tame elephants. But you may take it from me, they seldom do so.

Prompt retalliation :—No doubt, if a person torments or treats an animal cruelly, it retaliates. This, however, it does immediately or soon after—and not years later, as the popular mind loves to fancy. I couldn't ascertain on what grounds it was, but recently a wild elephant conceived a grievance against a watchman on the Mysore—Mettur electric cable posts. And when the latter was alone he learned a bit of the animal's mind.

Jumbo's desire for uprooting the posts must be ascribed rather to a mischievous mood than any native ferocity. We

have sometimes seen a similar exhibition of a playful temper when a group of elephants charged a hillside (with loose soil) with their tusks. Often, their rubbing against trees, posts, etc., is to keep their wounds clean that way.

They rarely attack man wantonly. Lords of the forests and mightiest of beasts, they are remarkably gentle for their strength and size. Though curious, they are tempered by a high degree of caution. If they scent danger, they convey the news to others by a peculiar alarm signal. All then move away quickly and quietly before the surprised or frightened spectator has had time to know what has happened

Stray rogues :—But the rogue is an exception. Though I wouldn't go so far as to say that he attacks without cause, yet he finds pleasure in teasing an innocent passer-by,—and sometimes visiting the village crops uninvited. But generally there are few rogues as they are marked and receive special attention at the hands of the sportsmen.

The rogue even departs from gentlemanly etiquette as he now and then indulges in biting the tails of other animals— a thing which a tusker won't stoop to. If regular members of a herd have cause for grievance against one another—as not infrequently happens—they engage in a straight and honourable duel submitting to their own martial code. A well-matched contest drags for a day, with many rounds at frequent intervals.

In each round, by mutual consent, the beaten animal withdraws for a while and then the two meet again. Tusks are freely used if a keen fight is on, but charging with the forehead is also common. The ears are cocked, the tails stiff and erect, the trunk rests or is coiled on the tusks, and the head is raised aloft then. It is the longer tusked one that usually wins in the end. In flight an elephant can cover about 15 miles an hour, the longest pace being six and a half feet. It doesn't trot, gallop, jump or leap—it is not usual for an elephant to do any of these things.

The female elephant with young calves will not put up with any interference with the latter—though a tamed animal may allow you to fondle its young ones The tuskers, do not lead the herds, but the females do—with their calves walking under the protective canopy of their broad bellies.

Courtship and calves :—To remove another popular misconception on the courtship of elephants: The female it is that makes advances. Elephant pregnancy does not extend to twelve years as many Hindus would have it. If it is a male calf which is coming, the period of gestation is twenty two

months, if a female it is only eighteen months. It is also incorrect to assume that there is a very long interval between the coming of two calves. Sometimes you can see two or three calves—which have come in quick succession—sucking together. Again they suck with their mouths and not their trunks. Nor do their elders fill their trunks the whole length with water, but only up to about fifteen inches. Though it is possible they seldom pick the proverbial needle from the ground with their trunks.

A mad elephant is not a rogue elephant. Nor is the madness due to its eating a certain fruit; it causes only some intoxication. The madness is not of a sexual origin either. It seems to be due to and its approach can be detected from an oily substance exuded from the holes in its temples.

800 lbs. of food ! :—I should like to explode the whole-shell myth too. An elephant does eat the wood-apple, but the shell is never passed out unbroken *via* the entrails. A wild elephant consumes more than you imagine—or is given after capture. It requires daily about 800 lbs. of food—nearly the quantity it can carry on its own back.

Though among us humans, women may live longer than men it is not so among wild elephants, The superstition that in old age elephants seek some obscure corner, and there die peacefully does not seem to be true. They die from natural causes, a common affliction being a kind of dropsy. Even in healthy animals lost tusks are not renewed; nor do the young shed the first set, and grow a second. And the muckna—a male without tusks has not been observed to transmit this defect to its progeny, as some guess. —*The Illustrated Weekly of India*.

7. Wood Anatomy as a Link between Botany and Forestry :

By, B. J. Rendle.

The conception of forestry as being ultimately dependent for its advance upon the interaction of a number of more or less independent basic sciences is a familiar one. The problems associated with the tree considered as a plant and with the forest considered either as an ecological unit or an artificial crop call for special methods of attack which, while primarily concerned with some aspect of forestry, can incidentally contribute to the general fund of botanical knowledge. The study of wood anatomy, with special reference to the production and utilisation of timber, is a case in point. In modern times this somewhat specialised subject has advanced along several different lines according to the points of view of the investigators con-

cerned. The demand for practical methods of identifying and investigating the physical properties of commercial timbers has stimulated the study of species in this category. This has naturally been carried out more with reference to the important timbers of certain geographical regions than with botanical groups, and the woods of the north temperate zone in particular have received more than their fair share of attention.

In Germany, long before the end of the last century, certain of the timber producing species of outstanding importance to Continental forestry practice were submitted to intensive studies of their anatomical-technical characters, which, besides yielding results of direct practical application, were of value in instigating further research in the peculiar problems of plant physiology which are associated with the great size and long life of trees. More recently, the opening up of botanical exploration in the tropics has offered a wide field of investigation in wood anatomy. Numbers of new genera and species of great potential value as a source of timber incidentally provide material for the study of systematic anatomy which for richness and variety is far superior to the limited and rather specialised arborescent flora of the north temperate regions.

Botanical exploration in an entirely different direction, geological rather than geographical, has also been the means of advancing our knowledge of the structure of wood, particularly as regards the gymnosperms. Study of the structure of fossil plants has been of the greatest importance in the development of the subject; it has even been observed that at one time woody plants were better known anatomically in a fossil than in a living condition, and it is safe to say that some of the most valuable studies of coniferous woods have been prompted by a desire to elucidate the relationship of their fossil allies and their connexion with recent forms. These researches have resulted in the formulation of criteria capable of wide application, and in this way palæobotany has probably had a stronger influence than either taxonomy or physiology on the progress of wood anatomy.

In considering the systematic value of wood characters, as with any other part of a plant, the first essential is to recognise the kinds of characters that are to be found. Different writers have divided characters into various classes, each with a more or less descriptive name, but for the present it is only necessary to refer to the main divisions, namely, those which can be regarded as adaptations to environment, that is, 'biological characters', and those which have no apparent relation to the

environment and remain unaffected by variations in the conditions of growth; for these the term 'inherent characters' seems to be the most appropriate.

It is abundantly clear that the anatomical structure of wood is a product of two factors, heredity and adptation, and the successful employment of anatomical characters for systematic purposes depends on our being able to distinguish constant, inherited characters from those which are due to the influence of environment. In the course of generations of research, botanists have arrived at a fair idea of what morphological characters are constant, and to what extent they can be interpreted as indicating relationships. But in the case of wood there is relatively little information on this point and the need for further work of this kind is most pressing. The reason for this is not far to seek. The plants which are the subject of investigation in most fields of applied biology are generally available in a more or less complete condition, or at the least, their naming and classification is based on a study of those parts which are easily obtainable, but in the case of trees the difficulty is that the plant is such a large object; it is a laborious undertaking to examine the complete range of morphological and anatomical variation in a single tree, and when it becomes necessary to take into account the further variations induced by different conditions of growth, the problem assumes a much more formidable aspect.

Systematic botanists who have had to concern themselves with the critical study of trees from herbarium specimens are familiar with the morphological variation which occurs and which has often led to two or more specific epithets being attached to the same species when the trees have been described and named on incomplete botanical material. The similar variation in the structure of wood has not been sufficiently realised by all anatomists and this has in turn resulted in descriptions and the keys, based on a study of inadequate material and on characters which are not specific at all but only due to different conditions of growth, being used to differentiate between species. Many of the early researches in wood structure were directed towards the study of the size of the wood elements and their distribution within the growth ring, chiefly for purposes of identification. It is not yet fully realised in certain quarters that these features vary from tree to tree and that they vary more widely in different parts of the same tree.

Now, although this variation is considerable, the position of affairs is not so hopless as it might appear at first sight. It will not be necessary to cut and examine microscopically the

structure of hundreds of sections from dozens of different trees in order to obtain a reasonably accurate picture of every species But it is necessary to examine in detail a few species exemplifying selected types of structure in order to ascertain the limits of variability of each diagnostic feature and discover if possible the laws governing such variation. Critical anatomical surveys of this kind can only be undertaken by institutions in a position to obtain carefully selected trees and to examine them according to an ordered system of routine.

At the Forest Products Research Laboratory at Princes Risborough, the main consideration which underlies investigations in wood structure is naturally the influence of structure on the technical properties of the timber. There is no need to labour the point that in technological research one of the first essentials is to discover as much as possible about the physical nature of the material concerned. The cellular structure of wood is one of the most important factors in determining its physical properties, and a close correlation exists between changes in structure and changes in technical properties. The variation in the properties of timber grown under different conditions of climate, soil and sylviculture is one of the big disadvantages of the use of wood in industry for purposes which are in any degree exacting. The problem before us is to investigate the structure of a sufficient quantity of each species, grown under different conditions and in different parts of the country, so as to obtain an idea of the normal range of variation that is likely to occur. The same timber that is examined anatomically in the laboratory is also subjected to technical tests. In this way its general quality is correlated with the growth features, thus indicating to the forester the conditions of growth necessary to produce first quality timber. At the same time, the results of these investigations are the means of increasing our knowledge of the general principles underlying the relation between the structure and the properties of wood, knowledge which is in demand for assessing the technical value of wood from an exmination of its structure and for the proper understanding of the peculiar behaviour of wood under varying conditions of temperature, humidity and so on.

The lines of research that have been briefly outlined above, although directed primarily towards the solution of economic problems, are incidentally of importance in increasing our knowledge of the systematic anatomy of wood, and by virtue of their somewhat intensive character they are of special value in enabling us to distinguish between inherent and biological characters. From the severely practical point of view, this is of

obvious importance in order to place the identification of timber specimens on a sound scientific basis, and there is ample evidence that the anatomical characteristics of wood can usefully be taken into account in the solution of taxonomic problems. There can be no serious suggestion of attempting a natural classification of woody plants on the sole basis of their vascular anatomy, but on the other hand there is no gainsaying the fact that the nearest approach to the ideal system of classification will be based on a complete knowledge of the external morphology and internal anatomy of plants. Wood anatomy is is essentially auxiliary to taxonomy but it is an auxiliary that botanists cannot afford to neglect; it is, for example, of special value in throwing light on the systematic position of anomalous genera and provides a valuable test of the homogeneity of a family.

From the very nature of the subject the study of wood anatomy is confined to a comparatively small number of specialists, most of whom have been led thither by way of forestry or forest products research. In the belief that mutual benefit wood result from some measure of organised co-operation between workers in different parts of the world, the opportunity offered by the Fifth International Botanical Congress at Cambridge in 1930 was taken by a few interested parties to discuss ways and means of effecting such co-operation. Eventually an International Association of Wood Anatomists was formed, which has as its object the advancement of the knowledge of wood anatomy in all its aspects; this Association seeks to achieve its object by enabling workers in the same field to get in touch with each other, by facilitating the exchange of ideas, information and material and by working towards standardisation in terminology and methods of description.

Co-operative work has already been started on the preparation of a polyglot glossary of terms used in describing woods. Anyone who has had occasion to study the recent literature of the subject in different languages will have noticed the lack of uniformity in the use of terms and the need for some measure of standardisation. As a first step in this direction a provisional glossary of terms has been compiled in six languages, and by circulating this repeatedly to experts in different countries for corrections and suggestions it is hoped in course of time to achieve an approach to finality.

What is perhaps a still more important undertaking is the effort to increase the amount of authentic material available for research. This can only be done by inducing collectors to

obtain wood samples from the trunks of the same trees from which herbarium material is taken. It should be our aim to build up wood collections comparable to our national herbaria; those that we have are hopelessly encumbered by commercial samples of timbers and specimens collected in all good faith but entirely without regard to the need of ensuring their true botanical authenticity. There can be no better example of the need for co-operative effort than the preliminary work necessary to establish on a sound basis the thorough investigation aud successful utilisation of the timber resources of the overseas dominions of the British Empire. —*Nature, Dec. 3, 1932.*

8. Instructions for making Compost :

Collect all weeds, grass, leaves and other garden and household rubbish and allow them to accumulate in a pit. When work in the garden is slack, take out enough of this material to form a heap about 6 feet long and 2 feet high—chop any long stalks into small pieces. Take about a maund of fresh, concentrated cow-dung (not mere litter) and make into a thin " soup " with water, and thoroughly moisten the heap with it. *Keep moist* from day to day with occasional sirring until the temperature rises and then falls, and the mass becomes quite friable and has good " earthy " smell and brown colour. This fermented material constitutes the " starter " or " activator ". Having obtained a good " activator " which contains abundance of the organisms required, further quantities of material can be fermented more rapidly. One-third of the bulk of the heap of " activator " may now be added of new chopped material, and the whole well mixed and kept moistened with cow-dung solution. Cow's urine gives better results than a decoction of cow-dung but cannot always be obtained. Night-soil is better still but may cause trouble with the *Malis*. Bone-meal has been added with useful results but may also cause trouble. In the absence of the above materials, a solution of sulphate of ammonia, together with a little powdered *kankar* to prevent acidity, or ADCO mixture containing both nitrogen and phosphate may be employed. In all cases only enough of the nitrogenous material should be added to make the total percentage of nitrogen present about 2 per cent. on the dry matter. As soon as fermentation is complete, one-third of the heap may be removed and stored in a pit another third part of fresh material added and the process repeated. The cost is mainly labour, but as the work is done in spare time it need not be heavy.

—*Agricultural Journal of India, September, 1930*

Additions to the Gass Forest Museum for the year ending 31–12–32.

No.	Contribution	Contributor.
1	Section of a *Pinus longifolia* tree sixty eight years old, blown down by wind in the Bandy shola, Coonoor — (Breast height girth 11 ft. 5 in.)................	M. F. Bridge Esq., D. F. O., Nilgiris.
2	Section of *Dalbergia latifolia* eighty five years old, with a breast height girth of 8 ft., 7½ in., from Chenat Nair forests.	M. R. Ry. T. V. Venkateswarier, Avl., M.A., Working Plan Officer.
3	(i) Fifty botanical specimens, chiefly of *Leguminosae, Lauraceae*, and *Meliaceae*. (ii) Bark of *Acacia decurrens*, and *Acacia dealbatta*.	Students of the 1929–1931 Division, Madras Forest College.
4	Skull of a bison—thought to have been killed in a fight with an elephant.	R. S. Browne Esq., I.F.S., D.F.O., Nilambur.
5	Fifty two specimens of insects and Molluscs suspected as vectors of spike in Sandal.	N. C. Chatterjee Esq., Bsc., F. E. S., Assistant Forest Entomologist.
6	Two hundred blocks of wood (representing 150 species.)	A. R. Villar Esq., I.F.S. Conservator of Forests, Utilization Circle, Rangoon.
7	(i) Specimens showing seven stages of spike in Sandal. (ii) Specimen showing sandal haustoria on *Pongamia glabra* and *Acacia suma*. (iii) Specimens showing spike in *Dodonea viscosa, Zizyphus oenoplia, Datura stromonium*, and *Argyriea cuneata*. (iv) Three slides showing cochineal and lac insects. (v) Seven exhibits on lac.	M. R. Ry, S. Rangasami, M. R. Hons., Research Ranger, Denkanikota.
8	Photograph of *Lagerstroemia lanceolata* at Palakadavu.	C. C. Wilson Esq., I.F.S., Conservator of Forests.
9	Five charts of 210 South Indian birds—in colour.	Purchased from the Bombany Natural History Society.

Additions to the Madras Forest College Library during the year ending 31-12-1933.

A. **Books:**

1. Chemistry—inorganic and organic, with experiments —By Charles Bloxam. II Edition, 1872.
2. Roorkee Treatise on Civil Engineering. Section XIII Drawing for Engineering Students—Part I, 1907.
3. Logging and lumbering, or Forest Utilization—A Text Book for Forest Schools. By C, A. Schenck.
4. Soil conditions and plant growth. By E. John Russell. (Sixth) New Edition, 1932.
5. The Rod in India—By H. S. Thomas.
6. An elementary treatise on Ophiology with a descriptive catalogue of the snakes found in India and adjoining countries—By Edward Nicholson.
7. Fauna of British India including Ceylon and Burma,
   (i) Vol. III. Coleoptera. By Malcolm Cameron.
   (ii) Vol. VI. By W. L. Distant.
   (iii) Part III. Lamellicorneae—By G. Arrow.
8. Handbook of Commercial Information for India.—By C. W. E. Cotton, I. C. S.
9. A Treatise on Forest Engineering—By H.S. Gibson, I.F.S
10. Icones Pantarum—By Beddome.
11. Improvement of Woodlands—By W. E. Hiley, M A.
12. The Madras Stationery Manual, 5th Edn Vols. I & II, 1931
13. The Indian Field Shikar Book—By W. S. Burke.
14. Manual of Physical Training 1931.
15. The Botany of Bihar & Orissa—By H.H. Haines Part II.
16. Yogic Physical Culture—or the secret of happiness—By S. Sundaram.
17. Key to the Families of the Dicotyledons, Vol. I.—By J. Hutchinson, F.L.S.
18. Forest Trees and Timbers of the British Empire—By L. Chalke, and J. Burtt Davey.
19. Forest Management—By H. Chapman, M F. 1931.
20. A Manual of Cultivated Plants—By L. H. Bailey 1925.
21. Botany—Principles and Problems—By E. W. Sinnot 1929.

22. A Text Book of Botany (Revised)—By Coulter, Barnes, and Cowles. Vol. III. Ecology.
23. A handbook of South Indian weeds.—By C. Tadulingam F.L.S.
24. Plant physiological chemistry.—By Harvey.
25. Outline of Forest Pathology —By Ernest Herbert.
26. Exotic forest trees in the British Empire.–By R.S. Troup.
27. Forest facts for schools.—By Pack and Gill.
28. Spon's Practical Builders' pocket book.
29. Practical athletics and how to train—By A. Nelson.
30. The Game of cricket.

B. Bulletins, Pamphlets, Memoirs etc :

31. Forest Bulletin, No. 74 Summary of results of treated experimental sleepers laid in the various railway systems of India, brought uptodate by F, J. Popham.
32. No. 75 . Preservation of Indian Timbers—the open tank process—By F. J. Popham.
33. No. 76. List of plants collected in West Nepal.
34. Indian Forest Records, (a) *Silvicultural series* :—
   - (i) Vol. XV Part III. Standard, commercial and Heartwood volume Tables—Factory working.
   - (ii) Vol. XVI Part V Investigations on the seed and seedlings of *Shorea robusta* —By H. C. Champion.
   - (iii) Vol. XVI Part VII. Notes on *Pinus longifolia*.
   - (iv) Vol. XV Part IV, Volume Tables and diameter growth curve for Semal.
   - (v) Vol. XV Part VI. The use of stumps in artificial regeneration.
   - (vi) Treatment of Babul in Berar.

   (b) *Entomology series* :—
   - (i) Vol. XVI Parts IV and XI. Immature stages of Indian Coleoptera.—By L. C. M. Gardner.
   - (ii) Vol. XVI Part VIII. New Indian Curculinoideae—By Sir Guy Marshall.
   - (iii) Vol. XVI Part IX. Life history and control of *Celosterna scabrator*—By C. F. C. Beeson.
35. Bulletin No. 98. Pepper cultivation on the West Coast.
36. Bulletin No. 99. Results of experiments at Samalkota on intermediate season cropping.
37. Department of Statistics, India. Inland trade, Rail and river-borne. 1920–21.

38. Madras detailed standard specifications—for use in the Public Works Department of the Madras Presidency. 1931.

39. Leaf index of Madras Timbers—Manuscript prepared by Mr. A. W. Lushington.

40. Burma Forest Bulletin No. 25. (Ecology series). Forest soil and vegetation in the Hlaing Forest Circle Burma, By A. H. M. Barrington.

41. Burma Forest Bulletin No. 26. Insect damage to the timber of Teak—By D. J. Atkinson, I. F. S.

42. Burma Forest Bulletin No 27. Note on Burmese species of the genus *Dipterocarpus*.—By C, E. Parkinson.

43. Forestry commission, Bulletin No. 11. Nursery investigations—By H. M. Stephen.

44. Note on the establishment of *Aleurites fordii* (Tung oil) in the Ranchi Dt. of Chota Nagpur.—Reprinted from the *Indian Forester* 1930.

45. Note on Forest Protection in Burma.—By Unwin.

46. The Indian Limitation Act, 1908.

47. Nursery and plantation notes for Bengal, 1926.

48. Note on the artificial regeneration and tending of Sandal. By C. C. Wilson, and J. E. M. Mitchell, 1932.

49. Standard type designs of slab and timber-top drains culverts and bridges. Statement of materials required—By T. S. Pipe.

50. Advice on the pruning of roadside and street trees.—By the Roads Beautifying Association London.

51. The collection and preservation of herbarium and Timber specimens—By I. Burtt Davey, and L. Chalke.

52. An outline of modern knowledge—By Rose.

53. Forest Bulletin No. 34—1917. Note on Red Sanders—*Pterocarpus santalinus*., L.

54. Forest Pamphlet No. 15. Note on the preservation of Bamboos from the attacks of the Bamboo beetle or shot-borer.—By E. P. Stebbing.

55. Indian Forest Records. Vol. XI Parts 3. Regeneration with the assistance of Taungya in Burma.

56. The Herbarium of the Forest Research Institute.—By R. N. Parker.

57. Madras Forest Bulletin No. VII. Silvicultural Research in the Madras Presidency for 1923-24 and 1930-31.

58. Effect of certain climatic factors on the diameter growth of Long leaf pine in Western Florida.–By J. E. Lodewick.

59. Road proposals—Tharawaddy Division, By H. R. Blanford.

60. Note on the Rampa agency, East Godavari Dt.—By M. R. Ry. V. N. Seshagiri Rao Avl., B. A.

61. Oxford Forestry Memoirs, No. 9, 1923. Aerial survey in relation to economic development of new countries with special reference to an investigation carried out in N. Rhodesia.

62. Bulletin No. 97, Agricultural department. Results of the demonstration of agricultural improvements in the Madras Circle carried out in 1924–27.

63. Bulletin No. 94. Field Experiments with calcium cyanamide as a nitrogenous manure.—By B. V. Nath, F.I.C.

64. Bulletin No. 95. The work of the Livestock section.—By R. W. Littlewood.

65. Bulletin No. 96. Cultivation of grape-vine.

C. Working Plan :

66. Tadagam valley and Bolampatty Block III forests of the Palghat Forest Division, Madras Presidency —By M. H. Krishnasami Ayyar, E. A. C.—for 1930–39.

67. Nilambur Valley. Vol. III App. B. 1919–21.

68. Reserved Forest of the Jalpiguri Division, Northern Circle, Bengal, for 1926–27 to 1945–46.

69. Sandal forests of Dharwar—Bijapur Division and of Haliyal and Mandgood ranges of Northern and Eastern Kanara Divisions respectively.—By S. N. Kesargodi Esq.

70. Central Salem Division.—By W. H. Woodhouse Adolphus, E. A. C.

71. (Revised) For the Yerramalais in Kurnool West, for 1929–30 to 1938–39.

72. (Revised) For the Puri forest Division.

73. (Revised) For Soppinhasalli High Forest.

D. Miscellaneous publications :

74. Papers prepared for the use of the Thomason Civil Engineering College, Roorke. No. IV Earthwork, IV Edition, 1869.

75. Thomason Civil Engineering College Manual. Sec. V Estimating.
76. Asylum Press almanac and directory for 1925, 1929, 1931, 1932.
77. The Indian Year Book 1920, and 1931.
78. The Madras Agricultural department year Book, 1928.
79. Views of Dr. E. J. Butler, M. B., F. L. S., on the report by Rai Bahadur M. Muthannah, Conservator of Forests, Mysore on "spike" disease in sandal.
80. Note on the collection and preservation of entomological specimens with a description of the methods to be employed in the study of life history of insects—By E. P. Stebbing.
81. Report on the conference on Physical education held at Madras, on the 14th and 15th December 1927.
82. Third British Empire Forestry Conference, Australia and New Zealand 1928.
83. The analysis of Tanstuffs, preparation of samples and methods in use in the laboratory of the Esociet Tannin Research factory.
84. Forest Research in India 1921–22, 1922–1923, 1927–28, 1929–30, 1931–32.
85. Report on Silvicultural Research in the Madras Presidency for 1926–27.
86. The Agricultural College Calender 1927—28, 1929—30, 1930–31, 1931–32, 1932–33.
87. Calender of the Forest Research Institute and College Dehra Dun, Published triennially—1928, 1931.
88. Reports of the council and auditors of the Zoological Society of London for the year 1919.
89. A note on the determination of the melting point of resins —By M. Rangasami, B. A.
90. *Indian lac Association for Research* :
    (1) Reports of the committee of the Director, Indian lac Research Institute, Namkum, Ranchi, for 1928–29, 1929–30, 1930–31.
    (2) Bulletin No. 3. Wax and resin secretion by the lac insect on Butea frondosa.—By M. Venugopalan B. Sc.
    (3) Physical properties of shellac solution Part I 1923; Part II 1929.
    (4) Properties of shellac films, 1930.

91. A contribution to the life-history of the lac insect.—By P. S. Negi, M. Sc., Namkum, 1929.

92. Ants and the lac insect.—By Misra and Gupta.

93. Some aspects of the binomics of the lac insect.

94. The Noctuid moth. *Eublemma amabilis.*—By Misra.

95. Report of the Imperial Economic Committee. 10th Report. *Timber.*

96. List of Gazetted Officers of the Madras Presidency 1st October 1928, 1st October 1931, 1st January 1929, 1st November 1931, 1st January 1932.

97. List of Rangers in the Forest Department, Madras Presidency corrected upto 1st May 1930.

E. Reports :

98. Progress report of forest administration in :—
    - (i) Assam for 1930–31.
    - (ii) The United Provinces for 1930–31.
    - (iii) The Mysore State for the year ending 30th June 1930, 30th June 1931.
    - (iv) Bengal for 1929-30, and 1930–31.
    - (v) Punjab for 1930–31.
    - (vi) Burma for year ending 31–3–1931.
    - (vii) Coorg for 1930–31.—By H. G. Hicks.
    - (viii) Bihar and Orisa 1930–31 ; Central Provinces for 1930–31.

99. Administration report, Travancore, 1105 M. E., 1106 M.E.

100. Administration report, Ceylon for 1931.

101. Report on public instruction in the Madras Presidency for 1930–31.

102. Western Australia report on the operation of the forest department for the year ended 30–6–1931.

103. Account of the work and activities of the Industries department, Madras, 1926–27, 1928–29, 1929–30, 1930–31, 1931–32.

104. Administration report of the Forest Department of the Madras Presidency for the years ending 31st March 1931 and 31st March 1932.

105. Administration report for Bombay. Parts I and II.
    „ „ of the Agricultural department for 1930–31.

106. On the operations of the department of Agriculture, Madras Presidency for 1924—25, 1926—27, 1928—29, 1929—30.

107. (Second) Report showing progress made in giving effect to the recommendations of the Royal Commission of Agriculture in India. Parts I and II. (For the period 1st November 1929 to 31st December 1933)

F. Journals and Periodicals :

108. *Nature.* (48 Numbers of the year).

109. *The Indian Forester.* (January 1931 to December 1932).

110. *The Journal of the Bombay Natural History Society.* Vol. XXXV.

111. *Bulletin of the Imperial Institute.* Vol XXIX.

112. *Quarterly Journal of Forestry.* Vol. XXVI. 4 Numbers.

113. *The Empire Forestry Journal.* Vol. II 1932.

114. Yale University, School of Forestry. *Tropical Woods*— 4 Numbers (Quarterly).

115. *The Indian Journal of Agricultural Science.* Vol. II 6 parts.

116. Bureau of Forestry. *The Makiling Echo.* Vol. XI. 4 Numbers (Quarterly).

117. *The International Review of Agriculture.* Vol. XXIII Nos. 1 to 12.

118. *The Madras Agricultural Journal.* January to December 1932

119. *The Review of Applied Entomology :—*

Series A. Agricultural. Vol. XIX.

Series B. Medical and Veterinary. Vol. XIX.

Departmental Notifications.

17—10—32. *The following promotions of Rangers are ordered :—*

I

With effect from 22–9–1931, vice Ranger R. Manikkam Pillai reduced from the Second to the Third Grade.

Mr. P. Duraiswami Ayyar from Second Grade sub protem to Second Grade (temporary). His promotion will, however, take effect from 27–3–1932, and Rangers S. Ramachandra Ayyar and Antony Gulas will be promoted to Second Grade (temporary) from 22–9–1931 and 18–2–1932 respectively instead of from 18–2–1932 and 27–3–1932, as already ordered.

II

With effect from 22–7–1932 vice Ranger P. Sankunni Nayar, Sixth Grade resigned. Mr. S. Narayanaswami Ayyar from Sixth Grade sub protem to Sixth Grade (temporary). (2) Mr. I. John from Seventh Grade permanent to Sixth Grade sub-protem. (3) Mr. P. Gopalakrishna Rao from Seventh Grade sub protem to Seventh Grade (temporary). (4) Mr. C.H. Ramamurthi, from Seventh Grade temporary to Seventh Grade sub protem. (5) Mr. T. N. Vedanta Ramanujam, Forester, First Grade to Ranger, Seventh Grade (temporary).

III

With effect from 14–8–1932 vice Ranger A. Krishnamacharya, Second Grade, retired. (1) Mr. K.Karunakaran Nambiar from Third Grade permanent to Second Grade (temporary). (2) Mr. Thomas Thachil from Third Grade permanent to Second Grade sub protem. (3) Mr. K. P. Chathu Nayar from Third Grade sub protem to Third Grade (temporary). (4) Mr. C. T. Tiruvengadam from Fourth Grade permanent to Third Grade sub protem. (5) Mr. M. Rama Rao Kini from Fourth Grade sub protem to Fourth Grade (temporary). (6) Mr. A. Surya Rao Nayadu from Fifth Grade permanent to Fourth Grade sub-protem. (7) Mr. A. Joseph from Fifth Grade sub protem to Fifth Grade (temporary). (8) D. Krishnaswamayya from Sixth Grade permanent to Fifth Grade sub protem. (9) Mr. T. K. Parthasarathy Ayyangar from Sixth Grade sub protem to Sixth Grade (temporary). (10) Mr. T. S. Sankaranarayana Ayyar from Seventh Grade permanent to the Sixth Grade sub protem. As he was already promoted to the Sixth Grade sub protem from 13–5–1932 to 20–2–1932 the present promotion will take effect from 21–9–1932. (11) Mr. K. Puvappa from Seventh Grade sub protem to Seventh grade (temporary). (12) Mr. A. Sitharama Sarma from Seventh Grade temporary to the Seventh Grade sub protem. (13) Mr. V. Veeraswami Nayudu, Forester First Grade to Ranger, Seventh Grade (temporary).

IV

With effect from 30-5-1932 to 29-6-1932 vice Ranger K. S. Ramayya reduced temporarily from the Fourth to the Fifth Grade.

Mr. P. A. Venkatraman from Fifth Grade permanent to Fourth grrde sub protem.

V

With effect from 23-2-1932 to 26-3-1932 vice Ranger K. Chaikku reduced temporarily from the Sixth to the Seventh Grade for two months from 1-3-1932.

Mr. N. Ayyanna from Seventh Grade permanent to Sixth Grade sub protem.

25—11—32. The following promotions of Foresters are ordered :—

To First Grade (sub protem.)

1. Mr. V. Rengachari, Forester third grade from 10-5-32 vice C. R. Ramamurthy promoted to the Ranger's cadre. 2. Mr. S. Rangamannar Das, Forester, Second grade from 10-5-32 vice A. Sitharama Sarma, Forester promoted to the Ranger's cadre, 3. Mr. Y. Subrmania Nayadu, Forester, Third grade, from 22-7-32 vice S. M. Ansar Ali promoted to the Ranger's cadre. 4. Mr. P. Gulab Singh, Forester, Second grade from 22-7-32 vice T. N. Vedantaramanujam promoted to the Ranger's cadre. 5. Mr. M. Gopalsawmi Nayadu Forester, Second grade sub protem from 1-8-32 vice C. J. Muthanna deputed to the Forest College.

II. To Second Grade (sub protem) from 1-8-32.

1. Mr. K. M. Achayya, Forester, Third grade Forest Engineer's division in an existing vacancy in the Sixth circle. 2. Mr. N. C. Madappa, Forester Third grade, Third circle, in an existing vacancy in the Third circle. 3. Mr. K. S. Muthanna Forester Third grade, Third circle, in an existing vacancy in the Third circle. 4. Mr. M. Narayana Nambiar, Forester Third grade Third circle, in an exjsting vacancy in the Third circle. 5. Mr. S. Pitchayya Nayudu, Forester Third grade, Third circle in an existing vacancy in the Fourth circle. 6. Mr. F. B. Kaunders Forester Third grade, Third circle, in an existing vacancy in the Fifth circle. 7. Mr. A. S. Kaunds, Forester, Third grade, Third circle, vice S. Rangamannar Das (Second circle) promoted to the First grade. 8. Mr. M. B. Madappa, Forester, Third grade, Third circle, vice B. Gulab Singh (Second circle) promoted to the First grade. 9. Mr. M. S. Subbiah, Fotester, Fourth grade, Fifth circle, vice M. Gopalswami Nayadu (Fifth circle) promoted to the First grade.

III. To Third grade (sub protem) from 1-8-32.

1. Mr. M. D. Pitchai Pillai, Forester Fourth grade, Fifth circle, in an existing vacancy in the Fifth circle. 2. Mr. N. P. Chirukandan, Forester Fourth grade, Third circle in an existing vacancy in the Third circle. 3. Mr. V. Panchapakesa Ayyar,

Forester, Fifth grade, Fifth circle, in an existing vacancy in the Fourth circle. 4. Mr. D. B. Ekambaram Forester, Fifth grade, Sixth circle, in an existing vacancy in the Sixth circle. 5. Mr. K. A. Muddayya, Forester Fifth grade, acting Sixth circle, in an existing vacancy in the Fourth circle. 6. Mr. Marcel D' Souza Forester, Fifth grade acting, Sixth circle, in an existing vacancy in the Third circle.

3—12—32. With effect from 5-11-1932, vice K. R. Viswanatha Ayyar, Ranger, Third grade retired from service :—

1. Mr. C. T. Tiruvengadam, from Fourth grade permanent to Third grade (temporary). 2. P. A. Venkataraman, from fourth grade sub protem to Fourth grade (temporary), 3. Mr. T. Venkatasubbayya, from the Fifth grade permanent to Fourth grade sub protem. 4. D. Krishnaswamayya from Sixth grade permanent to Fifth grade (temporary). 5. Mr. I. John, from Sixth grade sub protem to Sixth grade (temporary). 6. Mr. T. S. Sankaranarayana Ayyar from Seventh grade permanent to Sixth grade sub protem. 7. Mr. A. Niladri Rao, from Seventh grade sub protem to Seventh grade (temporary). 8. Mr. A. Sitharama Sarma from Seventh grade temporary to Seventh grade (temporary).

II.

With effect from 5-11-1932 vice Ranger Saiyid Munawar reduced from the Fourth grade to Fifth grade.

Mr. A. Surya Rao Nayudu from Fifth grade permanent to the Fourth grade (temporary).

First Circle.

11—10—32. Mr. N. K. Sarma, Ranger Second grade granted leave on average pay for 4 months from date of relief in the Vizianagaram Estate (i. e. 29-10-1932).

15—10—32. Mr. S. Kotilingam, Ranger Sixth grade temporary, on expiry of leave on 26-10-1932, posted to Golugonda Agency Range, Vizagapatam division.

24—10—32. Mr. Y. V. Anjaneyulu, M. R. H., Forester. First grade Devagiri Range, Parlakimidi division, promoted to act as Ranger, Seventh grade from 4-10-32 vice Ranger A. Tirupathinayudu on leave. 2. Mr. V. Rangachari, acting Ranger Seventh grade, Ganjam division will revert to his permanent appointment as Forester Third grade from 29-10-1932 owing to reversion of Mr. N. K. Sarma, Ranger from foreign service.

29—11—32. Mr. M. A. H. Kirimani Sahib, Ranger Fourth grade granted leave on average pay on medical certificate for three months with effect from 27-10-1932.

25—11—32. The leave on average pay for 6 months from 8-5-1932 granted to Mr. R. Jagannadham Naidu, Ranger Sixth grade further extend by two months.

17—12—32. Mr. M. Subbarao, Ranger, Fifth grade, Kukuluba Range, Ganjam granted leave on average pay on medical certificate for 2 months from 6—12—1932.

22—12—32. Mr. D. E. Lewin, Ranger Third grade, in charge of Nugur Range, is granted leave on average pay on medical certificate for 3 months from 14—12—1932 afternoon.

2—1—33. In continuation of the 4 months granted to him Mr. A. Tirupathyrayudu, Ranger Seventh grade granted an extension of leave for 4 months from 24—12—1932.

Second Circle.

9—1—32. 1. Mr. D. N. Subramanya Ayyar Ranger Sixth grade, on expiry of his his leave on medical certificate posted to Dornal Range, Kurnool East division. 2. Mr. S. Varadarajulu Reddi Forester First grade and acting Ranger Seventh grade Dornal Range will revert to his permanent post in the same division on relief by No. 1.

21—11—32. B. T. Seetharama Ayyar, Ranger Fifth grade, Kurnool East division on expiry of his leave on 9—1—33 posted to Dhone Range, Kurnool West division. 2. Mr. T. K. Ramaswami Ayyar, Ranger Second grade, Dhone Range, Kurnool West division granted leave for 6 months and ten days. He is permitted to *retire* from the date of expiry of this leave.

24—11—32. Mr. D. N. Subrahmania Ayyar, Ranger Sixth grade, Kurnool East division granted extension of leave on medical certificate on half average pay for a period of four and half months from 22—11—32.

29—12—32. Mr. A. Ranganayakulu Nayudu, Ranger Second grade Gundlabrahmeswaram Range, Kurnool West division granted leave for 6 months from date of relief.

18—12—32. Mr. B. T. Seetharama Ayyar, Ranger Fifth grade Kurnool East Division granted leave from 7–9–32 to 22–12–32 with permission to affix the Christmas and New Year Holidays.

24—12—32. Mr. B. Venkata Rao, acting Ranger Seventh grade Fifth Circle, transferred to this Circle posted to Gundlabrameswaram Range in Kurnool West division, to join forthwith.

Third Circle.

19—10—32. In continuation of the one month's leave granted, Mr. S. Venkatrama Iyer, Temporary Ranger, Seventh grade attached to the North Coimbatore and Kollegal divisions, granted an extension of leave for two months,

20—12—32. Mr. M. P. Philip, Ranger Sixth grade transferred from the Fifth Circle to the Third (Working Plans) Circle posted for work in the Madura Working Plan division. He should report for duty at Madura before the Working Plans Officer, Madura who will issue orders as to his headquarters.

21—12—32. Mr. A. A. Joseph, Ranger, (Temporary) Fifth grade attached to South Coimbatore Working Plan division granted leave on average pay on medical certificate for two months from date relief.

Fourth Circle.

21—10—32. Mr. C. Karunakara Menon, Ranger Fourth grade, is granted further extension of leave for *a month and a half* in con-continuation of the leave granted.

21—10—32. 1. Mr. M. S. Krishnaswami Ayyar, Ranger Sixth grade Polur Range granted leave for 4 months from date of relief. 2. Subject to Chief Conservator's approval, M. B. Ka-lappa, Trained Forester First grade, is appointed to act as Ranger Seventh grade, Vice No. 1 granted leave.

1—11—32. Mr. M. V. Ganasen, Ranger Sixth grade, transferred from the Sixth Circle to the Fourth circle, posted to Polur Range, Vellore division.

Mr. T. N. Vedantaramanujam, Ranger Seventh grade (Temporary) is granted extension of leave on average salary on medical certificate for 1 month in continuation of the leave granted in North Salem District Forest Officer's S. O. No. 75 of 1932, dated 9-9-1932.

30—11—32. Mr. C. Karunakara Menon, Ranger Fourth grade, granted further extension of leave for a month and a half from 9-12-1932 in continuation of the leave granted.

30—11—32. Mr. M. R. Duraiswami Ayyar, Ranger Fourth grade, granted leave for 3 months from 1-12-1932 or date of relief. 2. Subject to Chief Conservator's apgroval, Mr. M. B. Kalappa, Forester First grade, appointed to act as Ranger Seventh grade, vice No. 1 granted leave.

24—12—32. Mr. T. N. Vedantaramanujum, Ranger Seventh grade (Temporary) on return from leave, posted to Namakkal Range in relief of Mr. M. B. Kalappa, Trained Forester, First grade to join forthwith.

24—12—32. P. Mathuramuthu Pillai, Ranger Second grade, granted further extension of leave for five months from 29-8-1932.

Fifth Circle.

11—10—32. Mr. Antony Culas, Ranger, Second grade from the South Coimbatore division to Kannikatty Range vice Mr. P. Ramaswamy Iyer Ranger Fifth grade reported sick, and to hold additional charge of the Kodamadi Range in the same division. 2. Mr. A. R. Manuals Ranger Sixth grade, on rel ef by No. 1, posted to the South Coimbatore division.

30—10—32. Mr. P. Ramaswami Ayyar, Ranger Fifth grade, Kanni-katty Range, granted leave from date of relief up to 17th December 1932.

18—11—32. The Chief Cnnservator of Forests has ordered the posting or Mr. C. M. Kushalappa, E. A. C. of Forests attached to Madura district to Natham Range. 2. On relief by 1, Mr. A. K. Kunhunni Nair, Ranger, Fourth grade, posted to Nangu-neri Range, Tinnevelly district, 3. On relief by No. 2 Ranger M. Gopalaswami Naidu transferred to North Coimbatore divi-sion.

21—11—32. On the expiry of the leave Mr. P. Ramaswami Ayyar, Ranger Fifth grade, posted to Kodamady Range, Tinnevelly District.

7—12—32. Mr. S. Venkatarama Ayyar, Ranger Seventh grade, transferred from Third (Working Plans) circle to Fifth circle posted to Kodamadi Range, Tinnevelly division.

7—12—32. Mr. C. Thiruvengadam Pillai, Ranger Fifth grade, Tint nevelly district, granted leave not due for 3 months with effec- from 29—9—1932. 2. On the expiry of the leave he is posted as Assistant Ranger to the Range Officer Tunacadave range, South Coimbatore divison.

20—12—32. Mr. A. K. Anantharama Ayyer Ranger, Seventh grade Mettupalayam Range, granted, leave on average pay for three months from date of relief.

19—12—32. The posting of Mr. P. Ramaswami Ayyer, Ranger Fifth grade, to Kodamadi Range, on the expiry of his leave, is cancelled. He will, on return from leave, remain attached to the Kannikatti Range, Tinnevelly district, until further orders.

4—1—33. Mr. P. Doraiswamy Ayyer, Ranger Second grade transferred from the First circle, to the Fifth circle posted for special duty in Natham Range, Madura District for verification of boundaries of reserves. He will work under the orders of the Extra Assistant Conservator in charge of that Range.

Sixth Circle.

17—12—32. Mr. P. Kannan, Ranger Sixth grade, doing special duty in Wynaad division, granted leave on average pay for four months from 4th October 1932.

1—11—32. Mr. V. Veeraewamy Naidu, Ranger Sixth grade (Temporaray), on the expiry of his leave on 2nd November 1932. transferred to Nilambur division, to be Assistant Ranger, Nilambur Range.

25—12—32. Mr. Khan Sahib Kunhirayan Sahib, Ranger First grade (Temporary) in charge of Amarampalam Range, Nilambur division, granted leave on average pay from 6th January 1933 to 15th February 1933. 2. Mr. A. Mohamed Akbar, acting Ranger Seventh grade, posted to Amarampalayam Range, Nilambur division (vice No. 1).

12—12—32. Mr. K. P. Chathu Nair, Ranger Third grade temporary, granted extension of leave for two months from 3rd December 1932.

11—1—33. Mr. I. Z. Robert Paul, Ranger Fifth grade, transferred to this circle posted to Wynaad division, headquarters at Manantoddy, for duty according to District Forest Officer's requirements.

NOTICE.

"The Indian Forester prize"—1933, for past students.

The subject for essay is:—

"The Problem of Game preservation in the Forests of India."

A prize valued at about Rs. 25 will be awarded for the best essay by past students.

No award will be made unless a satisfactory standard is reached. The essay should be clearly written or typed on one side of the paper only, and should not exceed 2000 words. It should be submitted to reach the Principal between the 10th May and 1st June 1933. Only essays received in this period will be considered. The work should be the unaided work of the competitor.

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